Amendments To The Specification:

The changes reflected herein will replace all prior versions of identified paragraphs in the application:

[0002] The present invention relates generally to expandable anchoring tools used in drilling operations. Further, the present invention relates to a method and apparatus for drilling a secondary borehole from an existing borehole in geologic formations. More particularly, this invention relates to a relatively small diameter apparatus which can be run into a borehole through a smaller tubing or otherwise restricted section and then expand**ed** to set within a section of larger diameter casing to perform downhole well operations.

[0007] Often however, a well bore is configured such that **a** tubular string of a smaller diameter is contained within a larger pipe string or casing, making ~~is~~ **it** necessary to run well tools through the smaller diameter tubular and thereafter perform down hole operations (such as sidetracking) within the larger area provide by the larger tubular or casing. An apparatus and method are herein disclosed which allow a relatively small diameter assembly ~~to be run~~ to be run into a borehole through a smaller diameter tubular or similar restriction and set in a relatively large diameter casing. Generally, such operations are known as thru tubing operation. Disadvantages of thru tubing tools known in the prior art include limited radial expansion capabilities and limited ability to securely anchor within the larger tubular diameter. It has been found that conventional thru tubing whipstock supports may be susceptible to small but not insignificant amounts of movement. Hence, it is desired to provide an anchor and whipstock apparatus that effectively prevent an anchored whipstock from moving. These disadvantages of the prior art are overcome by the present invention.

[0009] An embodiment of the tool includes a body ~~including~~ **with** a plurality of angled channels formed into a wall of the body and a plurality of moveable slips. The plurality of moveable slips translates along the plurality of angled channels between a collapsed position and an expanded position. The slips may include includes a plurality of extensions corresponding to and engaging the plurality of channels.

[0013] For a more detailed description of the preferred embodiment of the present invention, reference will now be made to the accompanying drawings, wherein:

Figures [[1a]]1A through [[1h]]1H are cross section, sequential views of a method of the present invention.

Figure 2 is a side, cross section view of the expandable anchoring tool of the present invention in a collapsed position.

Figure 3 is a top, cross section view of the expandable anchoring tool in a collapsed position.

Figure 4 is a side, cross section view of the expandable anchoring tool in an expanded position.

Figure 5 is a top, cross section view of the expandable anchoring tool in an expanded position.

Figure 6 is a perspective view of the tool in an expanded position.

Figure 7 is a perspective view of the slip of the expandable anchoring tool.

Figure 8 is a top view of the slip of the expandable anchoring tool.

Figure 9 is a cross section view of the slip of the expandable anchoring tool.

Figure 10 is a front view of the slip of the expandable anchoring tool.

Figure 11 is a cross section view of the slip in Figure 10 taken along **section** line [[A]]**11-11**.

Figure 12 is a cross section view of the slip in Figure 10 taken along **section** line [[B]]**12-12**.

Figure 13 is a cross section view of the slip in Figure 10 taken along **section** line [[C]]**13-13**.

[0016] It should be appreciated that the expandable anchoring tool described with respect to the [[F]]figures that follow may be used in many different drilling assemblies. The following exemplary systems provide only some of the representative assemblies within which the present invention may be used, but these should not be considered the only assemblies. In particular, the preferred embodiments of the tool of the present invention may be used in any assembly requiring an expandable anchoring tool.

[0017] With reference to Figures 1-13 the preferred method and apparatus of the present invention will be described. Figure 1 represents a preferred method of the present invention in eight sequential scenes labeled Fig. [[1a]]1A through Fig. [[1h]]1H. Fig. [[1a]]1A is a cross section of a part of the method where a setting tool 100, whipstock 110, and the expandable anchoring tool 400 are run into the main bore 5 through a restriction 7. In operation, the expandable anchoring tool 400 is lowered through casing in the collapsed position shown in

Figures 2 and 3, respectively. The tool 400 would then be expanded when fluid flows through flowbore 408.

[0018] These tools may be run into the wellbore using ~~**conventions**~~ **conventional** techniques, including both coil tubing and drill string methods. Fig. **[[1b]]1B** shows the whipstock 110 and anchoring tool 400 being oriented using an orienting tool and set. This orientation may be accomplished using conventional techniques well known by those skilled in the art. In a preferred embodiment, the whipstock 110 and expandable anchoring tool 400 are set hydraulically. As the anchoring tool 400 is set, the slips 420 are extended radially outwardly along angled channels in the housings. In one such embodiment, a piston is contained within a piston cylinder. When hydraulic pressure is applied, the piston 430 acts against the slip housings 421, 422, and 423, thereby applying the necessary force to expand the slips 420 radially via the channels in the housings 421, 422, and 423. In another embodiment, the tool 400 contains at least a pair of moveable slips 420 for engagement with a wall of a borehole or casing 120. Preferably, more than one pair of slips 420 is provided. The slip pairs may be offset in planes at a 90 degree angle, thereby providing maximum centralization and stability.

[0019] Fig **[[1c]]1C** shows the whipstock 110 in an oriented and set position. A hydraulically actuated hinge section 112 kicks the bottom of the whipstock ramp 114 against the casing wall 120. Figure **[[1c]]1C** shows the setting tool 100 being pulled from the main bore 5 through the restriction 7. Fig. **[[1d]]1D** shows a milling assembly 125 in the process of milling the main bore casing 120 to form a casing window 122. The casing window 122 is milled using conventional milling techniques and a lateral rathole 130 and/or borehole is drilled. The use and configuration of these components in the milling operation is well known by those skilled in the art. In Fig. **[[1e]]1E**, the lateral well bore 130 is shown having been drilled. In Fig. **[[1f]]1F**, a retrieval tool 101 is run into the main bore 5 in preparation **[[of]]** **for** the retrieval of the whipstock 110 and expandable anchoring tool 400. The anchoring tool 400 is designed to release with an upward pull, thereby retracting the slips 420 to a collapsed position. In Fig. **[[1g]]1G**, the retrieval tool 101 is run into the well bore 5. Fig. **[[1h]]1H** illustrates the retrieval of the whipstock 110, including the expandable anchor 400.

[0020] It should be recognized that while Figure 1 illustrates the milling assembly 125 being run in as a separate[[**d**]] trip from the whipstock 110 and anchoring tool 400, the milling assembly 125 can be run in the same trip with the whipstock 110 and anchoring tool 400. Thus, the system of the present invention can be run into the well bore, oriented, set, a window milled and **a** rathole drilled during a single trip.

[0022] The recesses 416 further include angled channels 418 that provide a drive mechanism for the slips 420 to move radially outwardly into the expanded position of Figures 4, 5 or 6. A piston 430 that is contained with**in** a piston cylinder 435[[,]] engages the lower slip housing 422. The piston 430 is adapted to move axially in the piston cylinder 435. A nose 480 provides a lower stop for the axial movement of the piston 430. A mandrel 460 is the innermost component within the tool 400, and it slidingly engages the piston 430, the lower slip housing 422, and the intermediate slip housing 421. A bias spring 440 is disposed within a spring cavity 445. An upper slip housing 423 coupled to the mandrel 460 provides an upper stop for the axial movement of intermediate slip housing 421. The nose 480 includes ports 495 that allow fluid to flow from the flowbore 408 into the piston cylinder 435 to actuate the piston 430. The piston 430 sealingly engages the mandrel 460 at 466, and sealingly engages the piston cylinder 435 at 434.

[0023] In one embodiment, a threaded connection is provided at 456 between the slip housing 423 and the mandrel 460 and at 458 between the nose 480 and piston cylinder 435. A threaded connection is also provided between the nose 480 and the mandrel 460 at 457. The nose 480 sealingly engages the piston cylinder 435 at 405. The upper slip housing **423** sealingly engages the mandrel 460 at 462.

[0026] In the embodiment shown in Figures 2 and 4, as the piston 430 moves axially upwardly, it engages the lower slip housing 422. Thereby, the lower slip housing 422 engages the slips 420a, which engage intermediate slip housing 421. The intermediate slip housing 421 engages the slips 420b, which thereby also engage the upper slip housing 423. The slips 420a and 420b will expand radially outwardly as they travel in channels **[[518]]** **418** disposed in the upper, intermediate, and lower slip housings 423, 421, 422.

[0028] As best shown in Figure 6, two slips 420a are spaced 180° circumferentially. An additional two slips 420b are also spaced 180° circumferentially relative to each other, but axially above slips 420a and rotated 90° circumferentially relative to slips 420a. This arrangement of the slips 420a and 420b is preferred to stabilize and centralize the tool 400 in the borehole. It should be appreciated, however, that multiple slips 420 may be disposed around the body 410. For example, there may be **four** slips 420 each approximately 90 degrees from each other or three slips 420, each approximately 120 degrees from each other.

[0032] Figures 12 and 13 shows a vertical view from the direction of mandrel 420 and further shows cavity 690 in **the** bottom **surface** 527 of slip 420. The cavity 690 extends for the full length of slip 420. Cavity 690 can be of any desired configuration so long as it conforms to a substantial portion of the circumference of mandrel. If mandrel 420 is curvilinear, then cavity 690 will be of conforming curvilinearity so that mandrel 420 matingly engages cavity 690. For example, if mandrel 420 is essentially round, then cavity 690 will be essentially hemi-circular as shown in Figures 12 and 13.

[0033] It is another object of this invention to provide an expandable tool that can return from an expanded position to a collapsed position. Referring to Fig. 4, the lock housing 721 is connected to the lower slip housing **422** by shear screws 775. To return the tool 400 to a collapsed position, an axial force is applied to the tool 400, sufficient to shear the shear screws 775, thereby releasing the locking means 720.